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CURRENT PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES [1]

December 3–30, 1933

The prevalence of certain important communicable diseases, as indicated by weekly telegraphic reports from State health departments to the United States Public Health Service, is summarized in this report. The underlying statistical data are published weekly in the Public Health Reports, under the section entitled "Prevalence of Disease."

Measles.—Reports indicated an increase in measles slightly above the seasonal expectancy. The number of cases reported for the current 4-week period was 20,496, approximately double the number for the preceding 4 weeks. In relation to preceding years, for the country as a whole the current incidence was 1.5 times that for the corresponding period in each of the years 1932 and 1931. For the past 4 years the incidence of measles has been very low; the average for this period for the years 1929 to 1932, inclusive, was approximately 14,000 cases.

A comparison of geographic areas shows that all sections contributed to the current increase, except the East North Central, in which area the number of cases (1,571) was only about 40 percent of last year's figure for this period. The disease appeared to be most prevalent in the South Atlantic, South Central, and Mountain and Pacific areas. In the South Atlantic States the number of cases (4,812) was more than three times that of last year, while in the South Central and Mountain and Pacific areas the numbers (2,462 and 3,182) were more than double those of last year.

Influenza.—The number of cases of influenza reported for the 4 weeks ended December 30 was 4,796, which was approximately 1,200 above the figure for this period in 1931 and only slightly above the reported incidence in 1930, but about two thirds of that in 1929, which was not an epidemic period. Influenza was epidemic in December of 1932, 157,860 cases being reported in this 4-week period of that year. Since February 1933, the influenza incidence has been

[1] From the Office of Statistical Investigations, U.S. Public Health Service. The numbers of States included for the various diseases are as follows: Typhoid fever, 48; poliomyelitis, 48; meningococcus meningitis, 48; smallpox, 48; measles, 47; diphtheria, 48; scarlet fever, 48; influenza, 38 States and New York City. The District of Columbia is counted as a State in these reports. These summaries include only the eight important communicable diseases for which the Public Health Service receives regular weekly reports from the State health officers.

low; no section of the country has reported more than the normal seasonal prevalence.

Diphtheria.—Although the usual seasonal decrease of diphtheria was apparent in all parts of the country, the number of cases (5,150) reported for the 4 weeks ended December 30 was 12 percent in excess of that for the corresponding period last year. For this period in 1931, 1930, and 1929 the cases totaled 7,246, 5,950 and 8,154, respectively. The disease seemed to be most prevalent in the South Atlantic and South Central areas. In the South Atlantic the incidence (1,030 cases) was 1.7 times that of last year—in fact, it was the highest incidence reported in that area for the 5 years for which data are available; in the South Central areas the incidence was 1.6 times that of last year; the West North Central area reported a slight increase over last year. Each of the other areas reported the lowest incidence for this period in 5 years.

Meningococcus meningitis.—In relation to previous years the incidence of meningococcus meningitis continued considerably below the level of the preceding 5 years. The number of cases reported for the current 4-week period was 172, only about 70 percent of last year's figure. Each geographic area shared in this favorable situation except the South Atlantic, where, since the middle of the current year, the incidence has been considerably higher than last year. The 33 cases reported for the current 4-week period was the highest number for this period in that area since 1929. The decreases in other areas ranged from 12 percent in the New England and Middle Atlantic States to 45 percent in the East North Central and South Central areas.

Smallpox.—For smallpox, the number of cases (515) reported for the current 4-week period was approximately the same as that reported for the corresponding period last year. For this period in 1931 and 1930 the numbers of cases were 1,238 and 2,172, respectively. A very favorable situation existed in all sections of the country except the East North Central and Mountain regions. Among the East North Central States, Wisconsin reported 165 cases for the current period as against 12 for the same period last year; in the Mountain area, Montana reported 19 as against 2 last year, Colorado 25 as against 2, and Utah 27 as against none. In other areas the incidence continued the lowest in recent years.

Typhoid fever.—For three consecutive 4-week periods the incidence of typhoid fever was higher than for the corresponding period last year. For the 4 weeks ended December 30 the number of cases was 945, as against 680 last year. However, for this period in 1931 and 1930 the numbers of cases were 1,175 and 1,266, respectively. The incidence in the New England, Middle Atlantic, South Atlantic, and East North Central regions closely approximated that of last year;

the West North Central and Mountain and Pacific regions each reported about three times as many cases for the current period as were reported last year; and in the South Central regions the number of cases (282) was twice that of last year.

Scarlet fever.—There were 18,174 cases of scarlet fever reported for the current 4 weeks, as compared with 18,237, 15,660, and 15,638 for the corresponding period in 1932, 1931, and 1930. In the New England and Middle Atlantic States the incidence of the disease continued considerably lower than that for last year, the number of cases (5,356) for the current period being only about 70 percent of last year's figure. All other sections of the country reported increases ranging from 8 percent in the East North Central area to 50 percent in the South Central area. For the country as a whole, scarlet fever has maintained a very satisfactory level throughout the entire year.

Poliomyelitis.—All sections of the country reported the usual seasonal decline of poliomyelitis during the current 4-week period, but the incidence was still considerably above (1.2 times) the level of last year and also above that of 1929. The incidence for this period in 1932 and 1929 was approximately the same and was relatively low. In 1931 and 1930 the numbers of cases in this period were 266 and 332, respectively. For the first time since the middle of the year the number of cases reported from the New England and Middle Atlantic and the West North Central States was lower than for the corresponding period last year. In the East North Central, South Atlantic, and Pacific areas the numbers of cases were almost double those of last year. The incidence in the West North Central and South Central areas was the lowest for this period in the 5 years for which data are available, and in the Mountain area it compared very favorably with recent years.

Poliomyelitis was less prevalent during the first half of the current year than during the first half of any of the last 5 years. The epidemic-like incidence which made its appearance in the latter part of July was confined mostly to the New England and Middle Atlantic and the North Central areas, other sections of the country being but slightly affected, if at all.

Mortality, all causes.—The average mortality rate from all causes in large cities, as reported by the Bureau of the Census, showed a seasonal rise from 11.2 per 1,000 population (annual basis) for the preceding 4 weeks to 12.1 for the 4 weeks ended December 30. For this period in the years 1932, 1931, and 1930, the rate was 13.4, 11.4, and 12.3, respectively. The 1932 rate was unduly high because of an influenza epidemic. The rate for the current period falls between the 1931 and the 1930 rates for this period. The rates for the first half of 1933 were uniformly below 1930, 1931, and 1932.

THE PHYSIOLOGICAL RESPONSE OF THE PERITONEAL TISSUE TO DUSTS INTRODUCED AS FOREIGN BODIES [1]

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The physiological response of the body tissues to dusts of various kinds has been a subject of much interest in the past few years, and the opinion that the injury due to dust is chemical rather than physical in action has recently gained greater ground. Mavrogordato, Gardner, Gye, and others have conducted experiments on the action of inhaled dusts. Kettle (*1, 2*)[2] has studied the response to dusts injected into the subcutaneous tissues and intratracheally, and Policard (*3, 4*) has used the cornea and conjunctiva in his recent studies. In 1924, experiments were begun at the Pittsburgh station of the United States Bureau of Mines to determine the action and fate of various dusts when injected into the peritoneal cavity of guinea pigs (*5*). The conclusions reached at that time were that live animal tissue in all parts of the body tends to react in essentially the same manner to foreign bodies and that fibrous tissue is formed in the peritoneal cavity by quartz and is not formed by limestone and coal. This paper reports a continuation and elaboration of these earlier studies.

Owing to the length of time required to obtain a reaction by inhalation methods and the desirability of determining the harmfulness of a dust in a relatively short time, other methods of introducing the dusts to be studied were considered. Injection into the peritoneal cavity seemed to give the most promise, because of the relatively circumscribed area of the cavity, the ease in controlling the amount of the dose, and the preservation of the sterility of the material introduced—a factor to be considered in inhalation and intratracheal methods. Mortality following intraperitoneal injection from peritonitis or peritoneal damage was found to be negligible. Identical reactions were found in each animal injected with the same dust under the same conditions and examined at the same time interval after injection. (Animals in groups of from 5 to 20 were used for each set of test conditions.) Therefore the fact that the reaction to the dust involves both epithelial and connective tissue is of no disadvantage.

The reaction is essentially the same microscopically as that produced in the lungs, and the gross appearance of the dust nodules is sufficiently differentiated to afford a means of classifying the physiological response to the dusts. In the series studied here, there were three types of reaction; namely, an absorption or dissolution of the

[1] From the Office of Industrial Hygiene and Sanitation.
[2] Italic figures indicate references cited.

dust, a proliferative reaction, and an inert reaction. In the inert reaction the dust neither caused an increase in the size of the nodules nor disappeared from the tissues; instead there was more or less a change in its distribution in the peritoneum. These reactions will be discussed more fully under the different groups of dusts.

PREPARATION OF THE DUSTS FOR INJECTION

It was desirable for the particle size of each dust in the series to conform as closely as possible to that of the other dusts used, and also to be as small as possible without a change in the physical or chemical composition. Particles passed through 100-, 200-, and 325-mesh standard sieves were used in one series of tests with several dusts. The 325-mesh size was found to be the most suitable, because of the greater facility with which a reaction is produced. The particles obtained by passing a dust through a 325-mesh sieve were less than 43 microns in size.

In a later series, a Roller type air separator (*6*) was used. This method of elutriation did not separate all the dusts in the series into fractions of the same size; yet it did produce, with one exception, samples less than 5 microns in maximum measurement. The exception, soapstone, measured 8 microns as a maximum particle size. The median size of the dusts used in this series varied from 0.75 to 1.7 microns, with soapstone at 3.5 microns. Such small variations in particle size appeared to be of no importance in comparing the physiological responses produced by the dusts. It can be readily seen that the air-separated particles more closely approximate those inhaled under industrial conditions (*7*). While the smaller particles were preferable, because of their greater assimilation by the cells, the particles that had been passed through a 325-mesh sieve gave the same gross reactions and, in the case of all dusts mentioned in this study, can be used in place of the more difficultly obtained smaller particles. Water separation was not attempted, because of the possibility of removing soluble portions of the dusts and thus producing a change in their chemical composition.

TECHNIQUE OF INTRAPERITONEAL INJECTIONS

A weighed portion of the dust and a few glass beads to facilitate suspension were placed in a small wide mouthed flask and sterilized in a hot-air oven for 1 hour at 150° C. After cooling, sufficient sterile physiological saline solution to make a 10 percent suspension was added, the bottle was closed with a sterile rubber stopper, and the whole was thoroughly shaken. Owing to the fact that a suspension of fine dust causes a locking of the plunger of a hypodermic syringe, air-bulb syringes of 3-cc capacity were used. Any small hypodermic

syringe, fitted with a rubber bulb in place of the plunger, will serve the purpose. Needles of 21- or 24-gage were found most suitable for the injections. The needles and syringes were sterilized in boiling water before use.

The hair on the right side of the animal's abdominal wall was clipped and tincture of iodine was applied. For injection, 2 cc of the 10 percent suspension, equivalent to 0.2 g of dust, was introduced, intraperitoneally, into each pig at the iodine-painted site. As the needle was withdrawn, a very small quantity, about 2 drops, was injected into the subcutaneous tissue, to serve as a marker of the site of injection. This marker made it possible to observe whether any trauma was produced by the introduction of the needle into the peritoneal cavity and its effect on the reaction instituted by the dust.

Certain groups of animals were injected with air-separated material and other groups with 325-mesh material. The former were killed and examined 7, 14, 30, 56, and 90 days after injection; the latter at the same intervals and also at 112 days.

DISTRIBUTION OF THE DUST IN THE PERITONEAL CAVITY

With the exception of bituminous coal, the greater part of each of the dusts in this series was found in the peritoneum of the anterior abdominal wall, the most dependent portion of the peritoneal cavity. The site of the next largest collection was the omentum. Small nodules and dispersed collections of particles were also found in the inguinal canals, on the mesentery, liver, intestines, testes or uterus, and diaphragm. A very little was occasionally found on the posterior abdominal wall. In the case of bituminous coal, the greater portion was found in the omentum and mesentery, while a relatively small part was present on the anterior abdominal wall. As a basis of comparison (in describing the reactions caused by the dusts), the nodules formed on the anterior abdominal wall were used, since they were more accessible and were more constant and uniform in appearance. The response in the omentum or at any other point in the peritoneal cavity was, however, the same as that found on the anterior abdominal wall. Nodules were only infrequently found in the peritoneum at the site of the entrance of the needle—so rarely, in fact, that it was safe to assume that the trauma produced by the introduction of the needle was negligible.

ADHESIONS IN THE PERITONEAL CAVITY

Adhesions between the various abdominal viscera and the anterior abdominal wall or omentum were at first thought to be of some significance. However, it was noted that while the presence of adhesions was more frequent when dusts of a high silica content were used

and correspondingly less frequent with such dusts as calcite and limestone, they were not of sufficient constancy to be used to draw any definite conclusions as to the activity of the dust. Adhesions were formed occasionally by calcite and by limestones of a very low silica content. They were likewise present to a marked degree in the animals injected with cement; yet subsequent observations showed that these dusts decreased appreciably in amount in the tissues as the tests progressed. It was concluded that the formation of adhesions was a result of the initial foreign body injury caused by the dust in the peritoneal cavity. Various attempts to alleviate this initial stage of irritation were tried without success. It can be readily seen that, while such a simple response as the formation of peritoneal adhesions would be of value in interpreting the activity of the dusts, the occurrence is of such irregularity and the factors involved in their formation depend so much on chance that their presence is of no particular importance.

THE PERITONEAL RESPONSE TO THE VARIOUS DUSTS

Calcite.[3]—Calcite, after being injected into the peritoneal cavity, formed nodules which were irregular, more or less discrete, but often clumped. A small amount of congestion and oedema was noted about the edges of the nodules in the early stages, but this had subsided before the end of 30 days after injection. This congestion and oedema were evidently due to the initial foreign body injury instituted by the dusts. The nodules became progressively smaller in size as the interval between injection and examination increased, and this decrease in size was accompanied by the production of brown pigment particles, which were first noted at the edges of the nodules, and later covered their entire surfaces and diffused into the adjacent peritoneum. The original dust eventually disappeared, leaving a small area of fine, brown pigment particles at the site of the nodule. These, in turn, soon disappeared without the formation of scar tissue. This type of reaction, namely the disappearance of the dust from the peritoneal cavity, has been designated, for the sake of description, as one of absorption.

Limestone.[4]—Limestone caused a reaction similar to that of calcite, one of absorption. The rate in which the dust disappeared from the tissues was much slower than in the case of the purer Iceland spar; yet there was such a marked decrease in the amount of dust found in 90 and 112 days after injection that it can be safely assumed that all of the dust will eventually disappear. The initial foreign body

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[3] Pure Iceland spar. Chemical analysis: Calcium carbonate, 99.8; silica, 0.1 percent. Median size of the particles, 1.4 microns.

[4] A high grade Pennsylvania limestone. Chemical analysis: Calcium oxide, 54.4; magnesium oxide, 0.4; iron and aluminum oxides, 0.4; silica, 1.5 percent. Petrographic examination showed granular, irregularly rounded calcite. Median size of the particles, 1.45 microns.

irritation and the production of the brown pigment and its disappearance from the peritoneum without the formation of scar tissue was identical with the process produced by calcite.

Precipitated calcium carbonate.[5]—Precipitated calcium carbonate produced a tissue response very much like that of calcite and limestone. The formation of the nodules was identical in character, and the original dust disappeared in about the same length of time as in the case of calcite; yet more brown pigmentation was produced, which lingered in the tissues for a longer time than did that formed by the calcite. This increased production of pigment might be attributed to the fact that the dust was in a state more easily assimilated by the cells. The pigment particles were much smaller in size and much greater in number than those produced by either calcite or limestone. No evidence of scar tissue formation was noted in any of the animals examined. The reaction was clearly one of absorption.

Gypsum.[6]—Gypsum eventually produced a response similar to that of calcite. In the early stages the dust appeared to lie inertly in the peritoneum without any appreciable change. By the end of 30 days a slight decrease in the amount of dust was noted, and by 90 days this decrease was marked. The color of the nodules became progressively darker as the interval between injection and examination increased, but the production of brown pigment, noted in the other three dusts, was absent. Fine, dispersed dust particles, more or less isolated, were noted in the peritoneum. These may have been the remains of nodules or else particles disseminated by phagocytes. The diminution in the size of the nodules and the disappearance of the dust from the tissues were not as rapid as in the case of calcite, limestone, and precipitated calcium carbonate; yet this response was sufficiently marked to designate the reaction as one of absorption.

Portland cement.[7]—Portland cement produced a reaction slightly different from that caused by calcite, limestone, precipitated calcium carbonate, and gypsum; yet the ultimate outcome appeared to be one of absorption. The initial foreign-body irritation was quite severe—so marked, in fact, that 16 of 36 guinea pigs injected with this dust died during the tests. This was probably due to the chemical properties of the cement. The animals that survived showed extensive peritoneal congestion and oedema in the early stages. After this reaction had subsided, the dust decreased in quantity, with the formation of a light brown pigment, similar to that produced by calcite,

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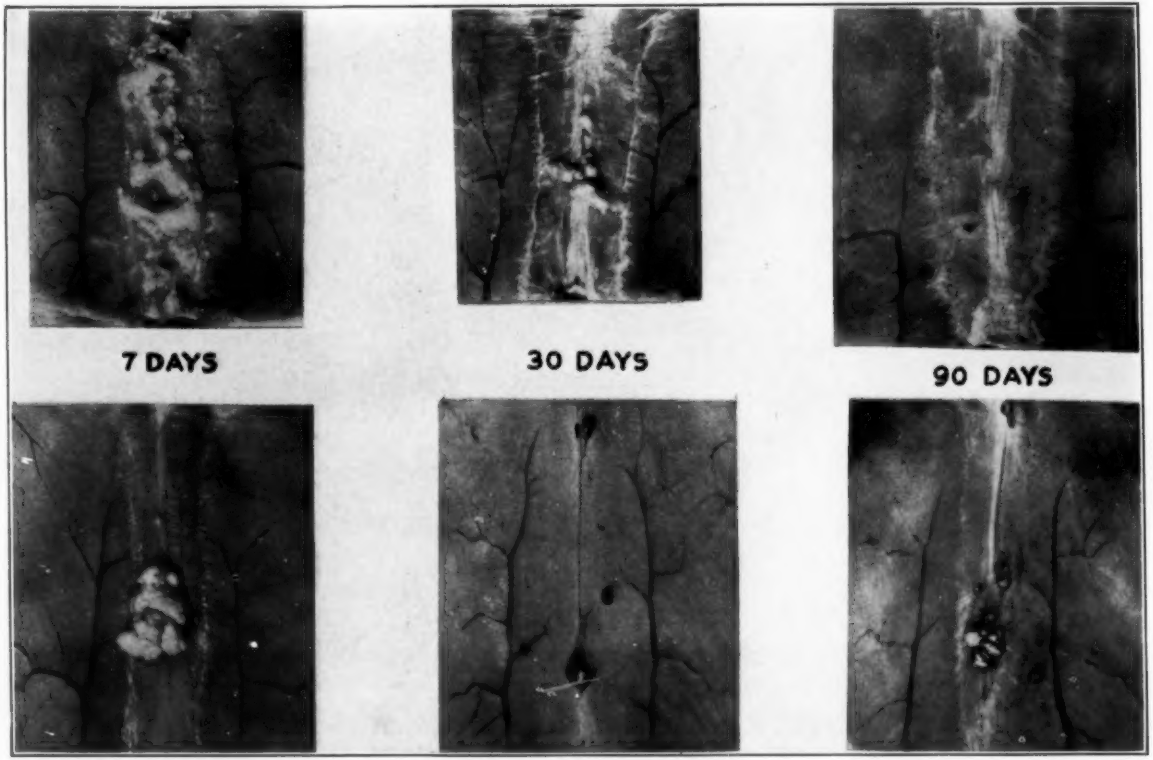
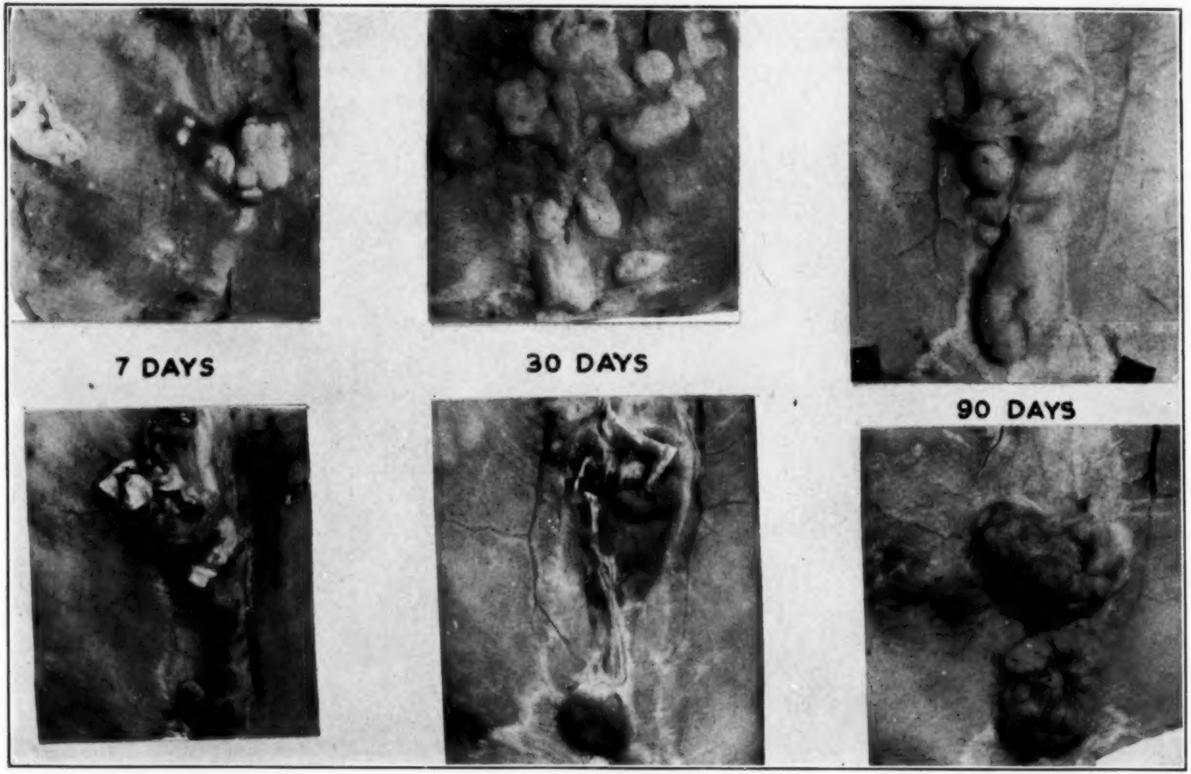
[5] A chemical by-product. Chemical analysis: Calcium carbonate, 87.9; magnesium carbonate, 10.0; magnesium oxide, 0.1; iron and aluminum oxides, 0.6; silica, 0.4 percent. Median size of the particles, 1.28 microns.

[6] The uncalcined, natural mineral. Petrographic examination showed approximately 30 percent as calcite in the form of rounded granules and irregular rhomboidal crystals and approximately 70 percent as fragmented particles of gypsum. Median size of the particles 1.3 microns.

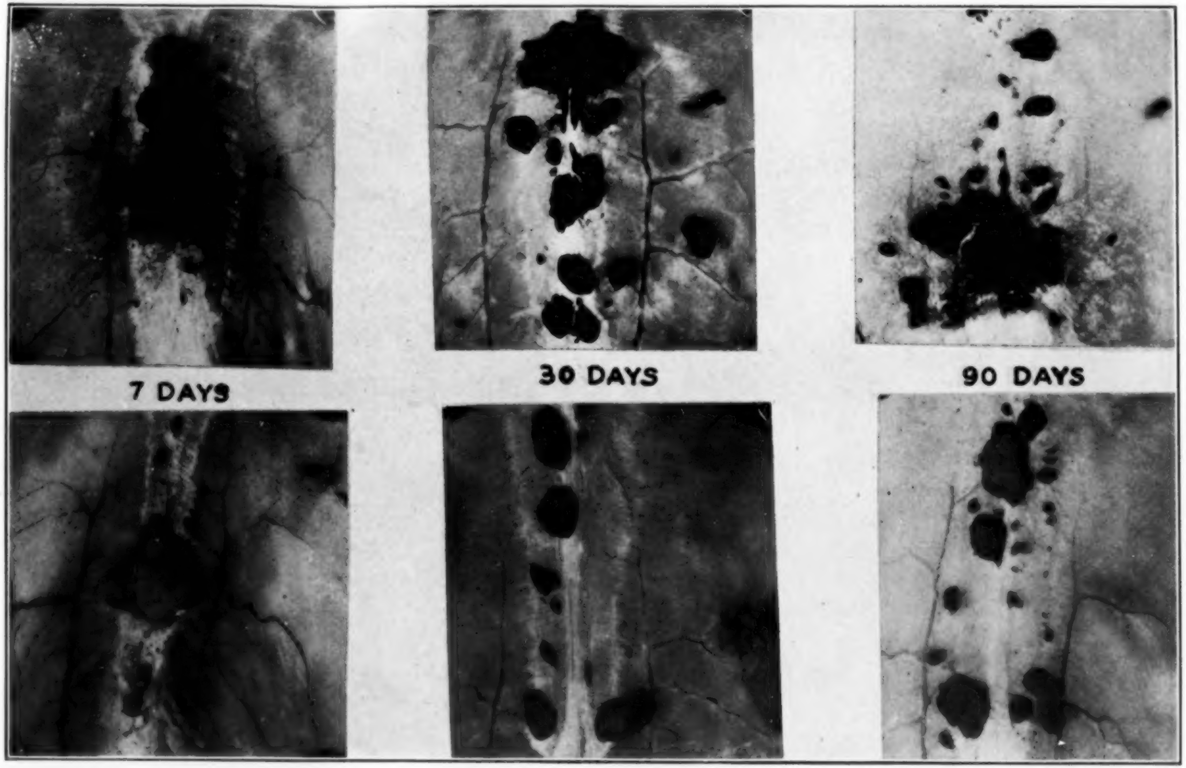
[7] Petrographic examination showed normal portland cement. The particles were sharp and angular. Median size of the particles, 1.05 microns.



Above, calcite; below, limestone. Appearance of nodules on anterior abdominal wall 7, 30, and 90 days after injection.

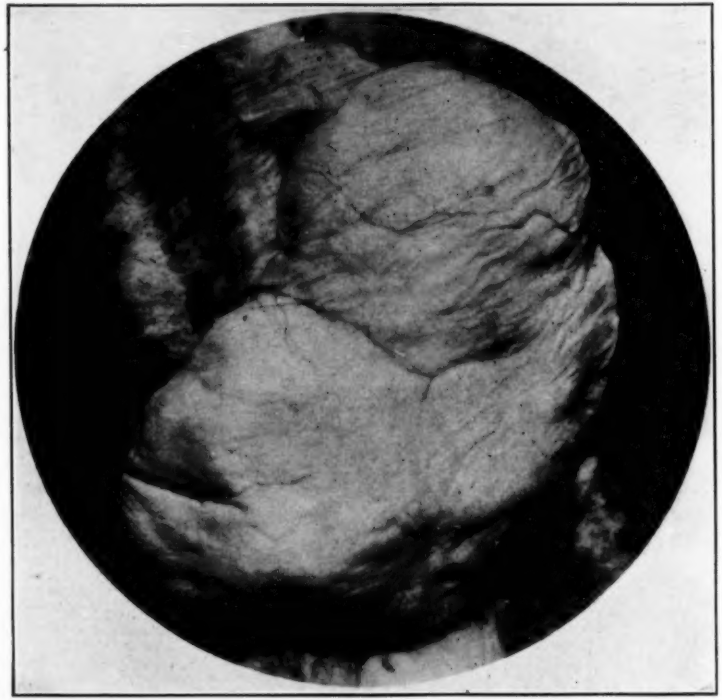


Above, flint; below, chat. Appearance of nodules on anterior abdominal wall 7, 30, and 90 days after injection.



Above, anthracite coal; below, jewelers' rouge. Appearance of nodules on anterior abdominal wall 7, 30, and 90 days after injection.

PLATE IV



Quartz nodule, 90 days after injection.

Calcite, 90 days after injection. Note fine, brown pigment granules in the peritoneum. These are all that remain of the nodule.

limestone, and precipitated calcium carbonate. At the end of 90 days after injection a large amount of this pigment was still present in the peritoneum. Experiments to determine whether this pigment will eventually disappear are now in progress.

Quartz.[8]—Quartz, after an initial stage of foreign-body irritation, manifested by oedema and congestion about the collections of the dust in the peritoneum, produced nodules which progressively increased in size. These nodules, when occurring in clumps, fused together, forming a single large mass. Numerous capillaries were present on the surfaces and throughout the nodules. The appearance was that of cellular proliferation and was apparently due to the chemical irritation supplied by the solution of the silica in the tissue and presumably will continue as long as any silica remains. Whether these nodules disappear with or without the formation of scar tissue is now being determined; but, inasmuch as the majority of cells found in the tumor masses were macrophages, fibroblasts, and fibrous tissue cells, it seems likely that scar tissue will be the logical result. This type of reaction, for convenience of description, will be referred to as one of proliferation.

Chat.[9]—Chat caused a reaction similar to that of quartz though the nodules produced by the action of the dust were much larger in size than those formed by the more pure rock crystal. The nodules found 90 and 112 days after injection were markedly larger in size than those noted in 7 days. The color of the nodules, which was the same as that of the dust introduced, remained constant throughout the duration of the tests. The reaction produced by chat was decidedly one of tissue proliferation.

Flint.[10]—Flint caused the formation of nodules identical in appearance to those produced by quartz. They were, however, somewhat smaller in size than those produced by chat in the same intervals of time. The response to this dust was clearly one of proliferation.

Soapstone.[11]—Soapstone produced the same type of reaction in the first 2 weeks after injection that was noted in all of the other dusts; namely, an initial foreign body irritation. This early fixation reaction was not severe and subsided quite rapidly. As the time between injection and autopsy increased, the nodules, at first raised and rounded, became flattened and spreading. The edges became irregular, and numerous fine dust particles were noted in the peritoneum

[8] Ground rock crystal of high purity. Chemical analysis showed 99.4 percent silica. Petrographic examination showed clear, crystalline, normal quartz. Median size of the particles, 1.7 microns.

[9] The waste product from the concentration of lead and zinc ores. Chemical analysis showed 76.1 percent silica. Petrographic examination showed quartz and chert, stained with limonite, predominating. About 25 percent of the silica was normal, angular quartz fragments. Median size of the particles, 1.22 microns.

[10] Finely ground Pennsylvania quartz. Chemical analysis showed 99.1 percent silica. Petrographic examination showed quartz of high purity. Median size of the particles, 1.6 microns.

[11] Chemical analysis showed silica, 49.9; calcium oxide, 1.7; and magnesium oxide, 26.2 percent. Petrographic examination showed about 30 percent as tremolite, about 65 percent as talc, and about 5 percent as dolomite. Median size of the particles, 3.5 microns.

adjacent to the edges of the nodules. Collections of these particles were found at various other points in the peritoneum. The amount of dust in the peritoneal cavity found 90 and 112 days after injection was approximately the same as that noted in 7 days. The injected dust was neither absorbed nor did it institute a cellular proliferation. The only change noted was that of the distribution of the dust in the peritoneum. The particles became more wide-spread in their dispersion as the interval between injection and examination increased, and this dissemination was shown microscopically to have been effected by macrophages. No appreciable change in the quantity of dust was noted in 112 days after injection; and, inasmuch as no dissolution of the dust or cellular proliferation occurred, this type of reaction, for the sake of description, will be referred to as one of inertness.

Carborundum.[12]—Carborundum, or silicon carbide, produced essentially the same type of reaction as soapstone. The initial stage of foreign-body irritation was not as severe, and the distribution of the fine-dust particles in the later stages of the tests was more extensive. Though the nodules became more flattened and spreading, the amount of dust found in the peritoneal cavity 90 days after injection was approximately the same as was noted in 7 days. The material is apparently a nonirritating, insoluble, foreign body and is readily transported throughout the peritoneum by phagocytes. As no absorption or cellular proliferation was noted, the reaction can be called one of inertness.

Jewelers' rouge.[13]—Jewelers' rouge, or ferric oxide, behaved in the peritoneum in a manner similar to that of soapstone and silicon carbide. The nodules became flattened, and many dust particles were extensively disseminated throughout the peritoneum as the time interval between injection and examination lengthened. The amount of dust observed 90 days after injection was approximately the same as that found in 7 days. The response of the peritoneal tissue to this dust is therefore one of inertness.

Anthracite coal.[14] [15]—Anthracite coal produced a more rapid response following injection than did soapstone, carborundum, or jewelers' rouge. Minute dust particles were noted in the peritoneum adjacent to the nodules as early as 7 days after injection. By 90 days this distribution was quite extensive. The amount of dust present in the

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[12] Pure, manufactured silicon carbide. Petrographic examination showed no impurities. Median size of the particles, 1.15 microns.

[13] Pure ferric oxide in a finely divided state. Petrographic examination showed a high purity hematite as fine, uniform particles. Median size of the particles, 0.95 micron.

[14] A Pennsylvania anthracite. Petrographic examination showed about 95 percent as coal and 5 percent as inorganic materials. Of the latter, about 60 percent appeared as quartz and about 40 percent as calcite, siderite, and rutile. Median size of the particles, 0.75 micron.

[15] A coal similar in petrographic examination to that described in footnote 14. Median size of the particles, 1.11 microns.

peritoneal cavity 90 days after injection was approximately the same as that found in 7 days, therefore it was concluded that anthracite coal dust was inert in reaction.

Bituminous coal.[16] [17]—Bituminous coal, like soapstone, carborundum, jewelers' rouge, and anthracite coal, appeared to be inert and insoluble in the peritoneum. The nodules behaved in a manner similar to those of the above-named dusts, and the dispersion of the dust particles throughout the peritoneum was particularly widespread. With this dust very few nodules were formed on the anterior abdominal wall, the most dependent portion of the animals' peritoneal cavity to which injected material would naturally gravitate; but the majority of the nodules were consistently found in the omentum. Many small nodules and diffuse areas of dust particles were also found in every portion of the peritoneal cavity. The amount of dust present 90 days after injection was approximately the same as that found in 7 days; therefore the reaction was one of inertness.

Precipitator ash.[18]—Precipitator ash, or "fly ash", produced a reaction similar to that of the other inert dusts mentioned in this series. The nodules behaved similarly in their progress to those formed by soapstone. Relatively coarse, black particles were noted on the surfaces of the dark gray nodules. These were evidently carbon particles, as the dust was of mixed composition. The dissemination of the original gray dust composing the bulk of the sample, while not as extensive as that of the coals, was well marked and apparently the same as was found with soapstone and silicon carbide. As there appeared to be no disappearance of this dust from the peritoneal cavity or cellular proliferation, it seems safe to class this dust as inert in type.

SUMMARY

1. A definite quantity (0.2 g) of dust in suspension was injected intraperitoneally into guinea pigs.

2. Dusts of two particle-size groups were used—one of screened material with particles less than 43 microns (325 mesh), and the other of air-separated material with particles varying from less than 2 to 8 microns in size.

3. The animals injected with the coarser material were examined 7, 14, 30, 56, and 112 days after injection, and those treated with the air-separated material were examined after 7, 14, 30, 56, and 90 days.

4. The response caused by the dust in the peritoneal cavity was

[16] From Pennsylvania. Petrographic examination showed from 1 to 2 percent inorganic content, essentially all calcite. Median size of the particles, 1.15 microns.

[17] From Pennsylvania. Petrographic examination showed from 1 to 3 percent inorganic content, mainly quartz, calcite, and clay. Median size of the particles, 1.19 microns.

[18] Collected from stacks by electric precipitation. Chemical examination showed 44.7 percent silica. Petrographic examination showed predominantly perfectly spherical fused glass, rounded semifused masses made up of crystallites ,some quartz fragments, calcite, and coal. Median size of the particles, 1.43 microns.

constant in all of the animals injected with an individual dust and could be classified as an absorption, proliferative, or inert reaction.

5. In the absorption reaction the injected dust disappeared from the peritoneal cavity without the production of scar tissue.

6. In the proliferative reaction the nodules produced by the dust continued to increase in size up to 112 days after injection, the maximum duration of the tests in this series.

7. In the inert reaction the amount of injected dust remained approximately the same in the peritoneal cavity throughout the various periods, but the nodules became more flattened and fine particles of dust were carried over rather extensive areas in the peritoneum by phagocytes.

8. Calcite, limestone, precipitated calcium carbonate, gypsum, and cement exhibited an absorption reaction.

9. Quartz, chat, and flint produced a proliferative reaction.

10. Soapstone, carborundum, jeweler's rouge, anthracite coal, bituminous coal, and precipitator ash were inert in reaction.

CONCLUSIONS

The tissue of the peritoneal cavity responds actively to a dust introduced as a foreign body, and this response is of such a character that it may be used as a basis for the classification of industrial dusts from a physiological standpoint. In this report, dusts of uniform chemical composition or those definitely known to produce or not to produce silicosis were used, and for this group the reaction occurring in the peritoneal cavity was uniform and constant for each dust. It seems probable, in view of the nature of the reactions, that dusts of mixed chemical composition will produce responses similar to those found in this series of dusts.

Tests of longer duration are now in progress to determine the ultimate fate of the dust in the peritoneal cavity; yet for purposes of obtaining a definite response to any dust 90 days appears to be a sufficient time interval between injection and examination.

ACKNOWLEDGMENT

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SULPHUR DIOXIDE FOR THE FUMIGATION OF SHIPS*

METHODS OF USE AND PROSPECTS OF IMPROVEMENT

By C. L. Williams, *Senior Surgeon, United States Public Health Service*

Sulphur dioxide has been used for many years in the United States for the disinfection of ships. The discovery that germs were causes of disease and that they could be destroyed by fumigation became the basis of its employment for this purpose in the latter part of the past century. While the procedure was utilized against all of the quarantinable diseases, it was employed most particularly against yellow fever—before the discovery that this disease is transmitted by the mosquito, in the hope of destroying the virus, and, after this discovery, for the purpose of destroying the vector.

Fumigation with sulphur was the principal method utilized on ships in the United States until 1914, when hydrocyanic acid was introduced as a practical ship fumigant. Before the appearance of the cyanide gases, a relatively brief competition was set up by funnel gases—that is, a mixture of carbon dioxide and carbon monoxide; but the apparatus proved too cumbersome for general use, and its failure to destroy fleas was considered a disadvantage for antiplague measures.

While today in the United States hydrocyanic acid has largely replaced sulphur, the latter is still in use at many of the smaller quarantine stations, where it is economically impracticable to maintain fumigation crews trained to use the more hazardous cyanide. About 30 percent of ship fumigations are performed with sulphur.

In the use of sulphur dioxide, the United States Public Health Service has never seriously departed from the method of producing this substance by burning sulphur, and has employed this method in two ways: One has been to burn the sulphur, in small lots, in iron pots placed inside the spaces to be fumigated; the other, to burn it in a specially constructed furnace, from which it was blown through large tubes into the ship. For a time sulphur furnaces were very

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largely employed; but, as their faults became apparent, they were abandoned, and today sulphur fumigation is almost exclusively performed in this country by burning sulphur in pots. The amount of sulphur used per 1,000 cubic feet of space fumigated has always been prescribed by regulations; but accurate control of fumigation by chemical tests, to determine the actual percentage of fumigating gas present, has rarely been employed.

While the quarantine regulations provide that liquid sulphur dioxide is an acceptable fumigant, and prescribes the amounts to be used, it has been actually employed in ship fumigation in this country quite rarely, no doubt principally on account of the higher cost.

METHODS OF USE

The utilization of sulphur dioxide by burning sulphur in iron pots is a method that has been universally employed and hardly needs description. As applied in the United States, special stress has been laid upon the absolute necessity of opening rat harborages and other enclosed spaces to permit ready access of the fumes, and the necessity of burning the sulphur in relatively small portions, so arranged that in each compartment there will be burned the total amount of sulphur necessary for the fumigation of that space, thereby providing for a more even distribution. Fire hazards have always been minimized by placing the sulphur pots in shallow pans of water.

The sulphur furnace generally used in the United States was the Kinyoun-Francis furnace, consisting of a roasting pan on which the sulphur was burned, a baffled flue, a blower, and conveying tubes. Its principal disadvantage was that much of the sulphur was sublimed and deposited in the conveying tubes, with the result that the delivery of sulphur dioxide could seldom be accurately gaged. The Clayton apparatus never came into general use in this country.

It may be well here to comment upon certain other procedures for utilizing sulphur dioxide that are in use in Europe and other parts of the world, but not generally employed in the United States.

"Salforkose" undoubtedly represents an improved method of producing sulphur dioxide by burning. Instead of sulphur, carbon bisulphide is burned under controlled conditions. The essential improvements consist in the more rapid production of a given amount of sulphur dioxide, its more even distribution caused by the more rapid combustion, and increased accuracy of dosage due to complete combustion.

In many ports the Clayton apparatus is employed. It consists essentially of a sulphur furnace, producing sulphur dioxide by burning sulphur, from which the gas is drawn through cooling tubes surrounded by flowing water and then blown into the ship. As generally employed, air is also drawn from the ship and circulated through the

furnace, the net result being the introduction of sulphur dioxide and the abstraction of oxygen in the same process. From accounts available, in order to insure efficient operation this apparatus must be controlled by testing the concentration of sulphur dioxide actually produced in the ship.

Liquid sulphur dioxide is used in a few ports. In some, it is employed by attaching to a cylinder of this substance a section of hose which is led into the space to be fumigated; the valve on the cylinder is then opened and the evaporating gas is permitted to pass out through the hose. This method has the very serious disadvantage that evaporation and expansion of the gas cause marked chilling, so that after a few minutes delivery becomes very much slower and may even stop entirely, owing to the freezing of water in the valve. To obviate this defect, recourse has been had to inverting the cylinders and delivering the liquid sulphur dioxide through an outlet hose and spray nozzles. This appears to be a preferable method.

"Marot gas" consists of liquid sulphur dioxide that is vaporized by being passed through a furnace from which it may either be blown into a ship by a blower, or carried through a hose under its own pressure. Theoretically, this method represents an improvement in the use of liquid sulphur dioxide but has the practical disadvantage of requiring bulky apparatus.

The use of liquid sulphur dioxide has one material advantage over other methods in that it permits of accurate dosage. The actual amount of the liquefied gas that is used can be definitely determined by weighing the cylinders during the process of discharge. Liquid sulphur dioxide, having twice the molecular weight of sulphur, theoretically must be used in quantities twice as great.

AMOUNT USED AND TIME OF EXPOSURE

In the United States, 6 hours or longer has always been the period of exposure for sulphur fumigations on empty ships, and 12 hours or longer in loaded holds. Generally from 3 to 5 pounds of sulphur have been burned per 1,000 cubic feet. Theoretically, this would produce from 6 to 10 pounds of gaseous sulphur dioxide per 1,000 cubic feet, a theoretical concentration of 3.28 to 5.47 volume percent.

When liquid sulphur dioxide is used, from 6 to 10 pounds per 1,000 cubic feet are prescribed. Probably, in view of the greater accuracy of dosage and the more rapid production of maximum concentration, this results, in effect, in a larger dosage than when sulphur is burned.

DEFECTS OF SULPHUR DIOXIDE

However produced, sulphur dioxide exhibits certain inherent defects as a fumigant. Primarily there is the relatively high density of the gas, which prevents rapid and even diffusion and materially

slows penetration into retired spaces, particularly through small openings. The result, in comparison with such a gas as hydrocyanic acid, is an unavoidable reduction of effectiveness, an unevenness of action, and a prolongation of the fumigation, due both to a necessarily prolonged exposure period and to a relatively prolonged period required to remove the gas after fumigation.

Effectiveness is still further reduced by the high rate of absorption of this gas in water, the latter taking up some thirty times its volume. In ships' holds containing much moisture, this is a material factor.

A secondary defect of sulphur dioxide is the damage that it produces to certain cargoes and to various ships' fittings. This factor is economically sufficiently important to cause owners of most passenger ships greatly to prefer fumigation with hydrocyanic acid. It should be borne in mind that the term "damage" includes fire hazard in all cases where sulphur is burned inside of the ship.

When sulphur is burned, there are certain other considerations that lower effectiveness. To begin with, the sulphur itself is rarely 100 percent pure. In the second place, frequently a very considerable portion of the sulphur fails to burn; and when it all burns, complete combustion generally requires 2 to 4 hours or longer. In the third place, it is doubtful whether all of the sulphur is converted into sulphur dioxide; certainly, chemical tests will show that the theoretical concentration is never attained. It would seem that the substitution of "Salforkose" for sulphur would reduce most of the disadvantages enumerated in this paragraph.

The use of liquid sulphur dioxide involves at once the mechanical difficulty of rapidly introducing the required dosages. De Bruyne, in Rotterdam, and Gilmour, in Alexandria, have both unofficially reported that extended periods, up to several hours, were required to spray a full dose into ships' holds. At the New York quarantine station an air-jet sprayer has been developed to deliver liquid sulphur dioxide at a maintained rate of 4 pounds a minute. To fumigate a hold of 100,000-cubic-foot capacity requires (under present United States regulations) 600 pounds of this material, which, with only one sprayer, would take nearly 3 hours to introduce. The use of large-bore pressure tubing, adequate valves, and multiple spray nozzles appears to be indicated.

The Marot apparatus probably does not deliver the sulphur dioxide any more rapidly than does a single sprayer. It has the advantage of heating the gas, thus aiding diffusion. To deliver a heated gas rapidly in large amounts would require a rather considerable heat supply. Whenever rather cumbersome apparatus is not too great a disadvantage, however, this method would appear to be the best so far devised for utilizing liquid sulphur dioxide as a fumigant.

When liquid sulphur dioxide is introduced into a space, the chilling due to evaporation and expansion produces an increase in density of this gas (normally more than twice as heavy as air) and its tendency to settle to the floor is thereby increased. As a matter of fact, the greater part of the gas does settle to the lower levels and leaves the space at the top of the compartment almost free from gas. Under test conditions at the New York quarantine station it has been found that, when fumigating with liquid sulphur dioxide in the amount of 1 pound per 1,000 cubic feet, if the air is not agitated, rats placed on the floor will die in a few minutes, while those within 1 or 2 feet of the ceiling remain alive as long as 2 hours. Concentration tests in such instances disclose a concentration four times as high near the floor as near the ceiling.

When sulphur is burned in a furnace and blown into a ship, accurate and even distribution should not be expected unless determined by chemical tests of air samples drawn from fumigated compartments. As a matter of fact, any method of burning sulphur is likely to be highly inaccurate unless checked by chemical testing of concentration. This adds one more piece of apparatus to an already complicated equipment.

EFFECTIVENESS OF SULPHUR DIOXIDE

The subject of effectiveness will be considered only as it concerns the destruction of rats on ships.

The most completely illustrative example, of which the writer is aware, of both the effectiveness and ineffectiveness of sulphur dioxide is cited by Grubbs and Holsendorf (*1*) from the Report of the Board of Health on Plague in New South Wales, 1907. It is quoted as follows:

> The Adelaide Steamship Co.'s *Innamincka* runs from Melbourne, Victoria; in the south to Cairns, Queensland; in the north carrying general cargo and passengers; going south her cargo consists chiefly of sugar and bananas. She calls at Sydney, New South Wales, and at Brisbane, Makay, Townsville, Bowen, and Cairns, Queensland. She is empty only at Melbourne and at Cairns, and at these ports is fumigated for destruction of rats. On the voyage now spoken of, the *Innamincka* reached Sydney May 21 from Cairns, where she had been fumigated as usual, and sailed again for Melbourne on the 22d. During the night of May 21 a rat catcher of the intelligence staff set many traps on board and found the next morning that 18 live rats had been caught; in addition he found one dead rat lying beside the cages. The live rats were kept for some time and remained healthy, but the dead rat was found to be infected with plague. The vessel having sailed in the meantime, Melbourne was warned by telegraph. On arrival there on the afternoon of May 24 the vessel was arrested, anchored in the stream, and fumigated with her cargo on board. The next morning hatches were opened, she was taken alongside, and discharge of cargo was begun. In the course of discharging, 160 carcasses were found.

Having been emptied, she was placed under sulphur a second time on the afternoon of May 25, and when hatches were again opened on May 26, 164 more carcasses were turned out. After examination a number of these carcasses were declared to be plague infected. The ship was then thought to be rid of rats. She took on eight to nine hundred tons of cargo and sailed for Sydney as usual on her return voyage to the north. On arrival at Sydney, May 29, she was searched by the intelligence staff, under supervision of the chief sanitary inspector, and 41 live rats and 22 carcasses were collected. Consequently all of the cargo aboard was ordered out, and during the unloading 35 rats were killed and 34 more carcasses were found. The ship was then placed under sulphur for 12 hours, with the result of finding 509 carcasses of rats, 12 of mice, and 2 rats alive, though dying. Nevertheless live rats were still heard; the reason was afterwards found to be existence of a hole of communication between a forward hold and a cross bunker in which some rats had found protection from the fumes among the coal. It was thought necessary, therefore, to empty all the bunkers; this took 36 hours of continuous work. Then the afterpart of the vessel with the engine rooms and stokeholds were first filled with sulphur fumes, after which a second fumigation of the forward holds commenced. After this, 70 carcasses were found, but no live rats, and it was at length possible to say that no rats, alive or dead, remained on board. On June 3 she was released, and, after loading, pursued her voyage. Altogether 734 rats were delivered at the board's laboratories on or after May 29, of which about 160 were putrid; 70 of them were examined bacteriologically, being selected from the batches successively brought in, and including some of the putrid carcasses; 44 of these yielded positive films, and from 4 of them positive cultures of *B. pestis* were recovered. In all, 1,077 rats were destroyed on the ship.

Two superficial conclusions can be drawn from this report: The first is that fumigation by burning sulphur definitely kills rats; over 1,000 were killed by this means in this instance. The other is that many rats escape such single fumigations. It will be noted that at least 70 escaped 4 fumigations, finally succumbing to the last. Likewise, it can be calculated that 657 rats went through 3 fumigations, 877 rats through 2 fumigations, etc. It is most noteworthy that 75 percent passed through the first three fumigations and that most of these were destroyed only when a fumigation was performed with extra care and doubled exposure.

A third, more deeply hidden conclusion might be drawn, in conjunction with other fumigation experiences. It will be made more clear if a specific instance of fumigation with hydrocyanic acid is cited.

On October 24, 1926, the S.S. *Manila Maru* arrived in New Orleans with two cases of human plague on board. The ship was fumigated loaded and was then unloaded in the stream into lighters, this process being twice interrupted for fumigations. When empty, it was again fumigated. All four fumigations were with hydrocyanic acid gen-

erated in barrels, placed in the holds and superstructure, by adding sodium cyanide (10 ounces per 1,000 cubic feet) to dilute sulphuric acid. After every fumigation, rats, that had survived previous fumigations (specific figures are not now at hand), were recovered, though only five of these were recovered after the fumigation when empty. In all, 431 rats were killed.

Obviously, rats may escape multiple cyanide fumigations as well as those with sulphur. This brings us to the essential conclusion as regards all ship fumigations, which is that, to secure effective results, it is necessary that the way be opened for the gas to penetrate into the deep places where rats will seek to escape. This means that the ship must be properly prepared for fumigation, particularly that enclosed spaces be opened sufficiently so that the gas, whatever fumigant is used, will penetrate in lethal concentration. This is a part of their work that fumigators in general are loath to perform. Were it generally carried out conscientiously and intelligently, the margin of variation in effectiveness between different gases would be markedly reduced.

When we cross over to loaded ships, however, a different picture presents itself. The presence of cargo prevents access to, and the opening of, many harborages. At once, the gas that is the more penetrating and lethal in lowest concentration secures a marked advantage. That hydrocyanic acid possesses such an advantage over sulphur dioxide appears in the two instances cited, for 3 fumigations with HCN, performed while cargo was still in the holds, destroyed 99 percent of the rats, while 3 fumigations with sulphur (2 when the ship was empty) killed only 39 percent of the rats present. Whether the variation would have been as great had one of the methods in which the gas is blown into the hold been used is unlikely. Burning sulphur in a fully loaded hold is a peculiarly futile procedure. Very much the same applies, however, to the generation of hydrocyanic acid in barrels placed in fully loaded holds. In both instances the gas is generated only on one level and does not penetrate in appreciable amount to the levels below. With these or similar methods of introducing the fumigant, reasonably good results can be secured in loaded holds only when cargo is removed from the hatchways till all levels are accessible.

Very few direct comparisons of the effectiveness of sulphur dioxide and hydrocyanic acid have ever been carried out. The observations of Creel and Simpson (*2*) are most often cited on this point. In their work, fumigations were performed by burning sulphur in pots or by generating hydrocyanic acid in barrels—in both cases inside of

compartments fumigated. Results were checked by subsequent trapping. They are summarized in the following tabulation:

TABLE 1.—*Comparisons of effectiveness of SO_2 and HCN*

Fumigant used	Number of vessels	Compartment considered	Number of rats killed by fumigation	Number of rats subsequently trapped	Efficiency of fumigation (percent)
Sulphur dioxide	62	Entire ship	747	223	77
Cyanide gas	182	do	2,811	121	95
Sulphur dioxide	32	Superstructure	133	107	55
Cyanide gas	31	do	729	45	94
Sulphur dioxide	28	Holds, empty	702	28	96
Cyanide gas	34	do	854	9	99
Sulphur dioxide	10	Holds, loaded	104	59	64
Cyanide gas	10	do	80	20	80

Comparative penetration tests with SO_2 and HCN have been carried out at the New York quarantine station. For this purpose rats have been protected by placing them in boxes tightly sealed except for a varying number of ¼-inch holes at one end. Rats in boxes provided with 2 holes were always killed in 2 hours by fumigation with 2 ounces HCN per 1,000 cubic feet; those in boxes with 10 holes died within ½ hour; the effect in boxes with intervening numbers of holes varied proportionately between these extremes. When sulphur dioxide was used by burning 3 pounds of sulphur per 1,000 cubic feet, rats in boxes having 2 holes survived 6 hours' exposure; those in boxes with 4 holes died in about 6 hours; those in boxes with 6 holes died in 3 hours; those in boxes with 8 holes died in 2½ hours; and those in boxes with 10 holes died in 2 hours.

TOXICITY OF SULPHUR DIOXIDE

Sulphur dioxide, when breathed, is absorbed by the moisture on the mucous surfaces over which it passes. The solution is an irritant and destructive acid and at once sets up severe irritation of these surfaces, eliciting an inflammatory response. In the lungs this inflammatory response is associated with edema, which causes asphyxiation and death. The rapidity with which this occurs is largely a matter of the concentration of the gas.

Quite small amounts produce distinct irritation without material injury; this is the warning range. As the concentration is increased somewhat, the effect is not immediate death but sufficient tissue damage to cause pneumonia to supervene, the victim dying (or recovering) some hours or days later. Further increased concentration produces death after several hours through edema of the lungs. From this point the period of survival is roughly inversely proportional to the concentration of the gas, until a point is reached, which, according to Clark (*3*), is for rats 2 percent (by volume), in

which concentration death occurs within 5 or 6 minutes. Increase of concentration above this point appears to have little additional effect. In rats dying during fumigation, inflammation and edema of the lungs and respiratory surfaces and opacity of the cornea are about the only lesions.

For fumigation purposes it is desirable to use sufficient gas to produce death during the period of exposure. At the New York quarantine station it has been determined experimentally that approximately 0.1 percent by volume causes death of exposed rats in 2 to 4 hours; 0.2 percent causes death in 1 to 2 hours; 0.3 percent causes death in 1 hour or less; and 0.5 percent kills rats in ½ hour. This latter is the concentration produced by vaporizing 1 pound of liquid sulphur dioxide in 1,000 cubic feet of air. These figures are for rats exposed in the open. They represent the concentrations that must be attained, not in the open hold of a ship, but in the secluded rat harborages, to produce effective results.

DOSAGES AND EXPOSURES

The dosage of hydrocyanic acid used in the United States is 10 times that which will kill a rat in 30 minutes. On the same basis for sulphur dioxide, a concentration of 5 percent would be demanded. There are, however, material points of variation that must modify this proportion. Most important is that extension of the lethal effect of SO_2 beyond the period of the fumigation itself provides a material safety margin not available with HCN. Largely for this reason it is suggested that the concentration producing death in 1 to 2 hours constitutes a more reasonable minimum lethal concentration and that the concentration prescribed for fumigation should be not less than 2 percent. The concentration should be determined either by actual introduction of 4 pounds of liquid SO_2 per 1,000 cubic feet, or by chemical tests.

In view of the known relatively slow diffusion rate of sulphur dioxide and of its demonstrated reduced effectiveness as compared with HCN, and taking into account its slower mechanism of poisoning, it seems reasonable that it should be given a longer period to exert its effects. Its weight and slowness of diffusion permit long exposures (particularly in ships' holds where ventilation is principally through the hatch at the top), loss by leakage being relatively slow.

Stock (4) has suggested 8 hours as a minimum when sulphur is burned in the ship, this being based on investigations in England. In view of the slowness and inaccuracy of this method, this period of exposure is undoubtedly justified. If "Salforkose" is burned instead of sulphur, a material reduction in exposure would appear to be justified.

When sulphur dioxide gas is blown in from outside, accuracy can probably best be secured by dating the exposure period from the time when concentration in the space fumigated reaches 2 percent as determined by test. If this is done, it would seem that exposure could be reduced probably to 4 hours. A similar reduction in exposure for liquid sulphur dioxide would appear to be in order if exposure is dated from the time when the full dose has been introduced. In both of these cases, however, a reduction of prescribed exposure is likely to be confusing for the reasons that, in actual practice, fumigators are prone to time exposure from the moment when gas introduction is started and that it is doubtful whether there are many seaports where operation of the Clayton apparatus is actually controlled by testing concentration. When a method of rapidly introducing liquid sulphur dioxide is developed, one that will permit of introducing the full dosage in 30 minutes, it may be that reduction of exposure, when this material is used, may be in order.

In the present state of knowledge concerning sulphur dioxide, it is doubtful whether the United States Public Health Service would care to see the exposure time reduced to less than 6 hours, regardless of the method used.

FUMIGATION OF LOADED VESSELS

As has already been stated, the fumigation of a loaded hold by burning sulphur (or "Salforkose") therein is a futile procedure unless the hatchways have been cleared. Clearing of the hatchways means removal of the cargo from them to a level well below the lowest 'tween-deck so that the gas generated will have a clear road to all levels of the hold.

When the gas is pumped in from outside it may be introduced into all levels by blowing it down a ventilator. The practical application of this procedure, however, involves several mechanical difficulties, chief among them being the variation in relative pressure which will, in most cases, result in most of the gas passing into the upper level and the least amount into the lowest. It should not be too difficult to overcome this difficulty by using a properly adapted apparatus and by intelligent attention to details, such, for example, as passing the delivery tube down the ventilator directly into the various levels.

Liquid sulphur dioxide can undoubtedly be introduced by way of ventilators, into the various levels of loaded holds, in quite accurate amounts. Such procedure involves, however, the spraying of quite large quantities—hundreds of pounds—directly on the cargo stowed near the ventilator. What damage this might cause has not as yet been thoroughly investigated. Liquid SO_2 vaporized by heat and then blown into the different levels of holds would apparently not be subject to this objection. By such means, when using relatively small-bore hose and right-angled delivery nozzles, it should be practicable

to introduce reasonably accurate doses into the different levels without too great losses from return of the gas up the ventilator tubes.

It has already been brought out that, in loaded holds, sulphur dioxide appears to be decidedly less effective than hydrocyanic acid. However, it should be noted that the problem of introducing the gas has never been thoroughly worked out through the medium of completely controlled and subsequently checked-up fumigations. The work of Creel and Simpson included too few loaded ships and should be extended by testing other methods of introducing the gas.

HAZARDS

As compared with hydrocyanic acid, sulphur dioxide is only slightly hazardous. Records of death and injury due to sulphur fumigation are far too few to doubt that this is true. Even should we ascribe to effects of the gas all deaths from pneumonia following exposure to SO_2, it is not believed that the total would approach the record of known fatalities caused by cyanide fumigations. On the other hand, in proportion to the number of fumigations of all kinds, the total number of fatalities from this source is relatively small. Compared with deaths from plague, following its introduction into infectible territory, deaths from fumigation are but a drop in the bucket—a very small drop in a very large bucket.

This brings us to the point of view from which fumigation hazards are actually evaluated in most countries. Generally, the relative hazard of the procedure is balanced against the relative effectiveness in preventing the introduction of disease. A third factor is making an appearance as regards plague, that being the relative damage that may ensue if the disease is introduced. In certain parts of the world appears a fourth factor in the matter of local reaction to fumigation deaths. From the viewpoint of these factors, the present trend is in favor of the most effective procedure, even though it is adopted at the expense of a greater number of fatalities.

Further to discuss hazards from this viewpoint would be futile. In each country, authorities will doubtless determine procedures as these factors directly affect them. This point, however, should be brought out; that is, that with the present practice in force, of almost universal acceptance of fumigation certificates, whatever procedure is carried out in any one port, of necessity affects to some degree the safety of other ports visited by the same ships.

COMMENT

At the time of writing there does not appear to be sufficient accurate data at hand scientifically to evaluate fumigation of ships with sulphur dioxide. There are particularly required: (1) Determina-

tions of concentrations actually present in various spaces fumigated with SO_2, especially inside of enclosed and partly enclosed areas, rat harborages and the like; (2) test fumigations with this fumigant, followed by very carefully conducted refumigations (these preferably with cyanide), as well as by trapping and inspections to determine relative effectiveness.

Until data of this precise nature are at hand, it is tentatively suggested that the minimum standards should prescribe that concentrations of not less than 2 percent SO_2 by volume should be produced in spaces fumigated, and that exposure should be for not less than 6 hours from the time of starting the gas nor less than 4 hours from the time when a 2-percent concentration is reached.

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COURT DECISION RELATING TO PUBLIC HEALTH

Certain statutory provisions as to pollution of waters construed.—(Texas Court of Civil Appeals; *Turner et al.* v. *Big Lake Oil Co. et al.*, 62 S.W.(2d) 491; decided June 29, 1933.) Article 698 of the penal code of Texas and chapter 42 of the laws of the first called session of the 42d legislature of Texas related to the pollution of waters. Article 698 mentioned "any watercourse or other public body of water", while chapter 42 mentioned "any stream, watercourse or natural body of water of this State". The court of civil appeals held that article 698 referred to public bodies of water and had no application to privately owned watering holes. Respecting chapter 42 the court was of the opinion that the words "natural body of water of this State" referred to waters owned by the State in trust and not to waters privately owned. Said the court: "We think the phrase 'of this State' is used in the sense of ownership."

DIRECTORY OF STATE HEALTH AUTHORITIES—ILLINOIS—A CORRECTION

In the Public Health Reports of December 22, 1933, page 1520, Herman N. Bundesen, M.D., is named as chairman of the Board of Public-health Advisors of the State of Illinois. This is an error; Clifford U. Collins, M.D., is the chairman of the board.

DEATHS DURING WEEK ENDED DECEMBER 30, 1933

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Dec. 30, 1933	Corresponding week 1932
Data from 85 large cities of the United States:		
Total deaths	8,738	10,279
Deaths per 1,000 population, annual basis	12.2	14.7
Deaths under 1 year of age	616	713
Deaths under 1 year of age per 1,000 estimated live births (81 cities)	53	58
Deaths per 1,000 population, annual basis, first 52 weeks of year	11.0	11.2
Data from industrial insurance companies:		
Policies in force	67,260,416	69,055,125
Number of death claims	12,699	15,146
Death claims per 1,000 policies in force, annual rate	9.8	11.5
Death claims per 1,000 policies, first 52 weeks of year, annual rate	9.8	9.6

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers

Reports for Weeks Ended January 6, 1934, and January 7, 1933

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Jan. 6, 1934, and Jan. 7, 1933

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Jan. 6, 1934	Week ended Jan. 7, 1933	Week ended Jan. 6, 1934	Week ended Jan. 7, 1933	Week ended Jan. 6, 1934	Week ended Jan. 7, 1933	Week ended Jan. 6, 1934	Week ended Jan. 7, 1933
New England States:								
Maine		3	20	578	2	1	0	0
New Hampshire	5	1	2		103	2	0	0
Vermont		2			64		0	0
Massachusetts	13	33		173	945	141	1	1
Rhode Island	3	5		74	2		0	0
Connecticut	2	14	13	89	21	84	0	2
Middle Atlantic States:								
New York	59	65	[1] 26	[1] 794	573	854	3	5
New Jersey	29	26	22	419		260	2	2
Pennsylvania	70	79			501	374	1	4
East North Central States:								
Ohio	33	61	29	531	103	332	0	3
Indiana	36	79	56	1,652	166	15	2	6
Illinois	28	64	18	186	141	81	6	22
Michigan	13	17		147	7	239	1	0
Wisconsin	9	9	40	6,431	163	193	1	5
West North Central States:								
Minnesota	4	5	1	35	64	230	0	2
Iowa [3]	13	18	2	1,717	67	3	3	8
Missouri	60	37	11	200	321	32	1	3
North Dakota	5	1		1,888	45	64	0	1
South Dakota	2	6	1	205	157	7	0	0
Nebraska	11	10	11	268	33	3	0	0
Kansas	17	12	1	7,923	31	33	1	1
South Atlantic States:								
Delaware	4	6		2	5	1	1	0
Maryland [3]	11	13	31	2,064	16	9	1	2
District of Columbia	8	6	1	21	60	2	0	2
Virginia	69	31			232	139	2	2
West Virginia	20	23	81	4,018	9	157	0	1
North Carolina [3,4]	48	23	28	1,827	1,021	314	0	2
South Carolina [3]	23	13	960	3,667	367	63	0	0
Georgia [3]	13	15		1,490	897		2	1
Florida [3]	4	8	1	102	1	1	0	0
East South Central States:								
Kentucky	43	29	8	4,428	10		0	6
Tennessee	26	11	84	2,614	325	5	3	1
Alabama [3]	29	23	76	2,475	195		0	2
Mississippi [3]	15	7					1	0

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Jan. 6, 1934, and Jan. 7, 1933—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Jan. 6, 1934	Week ended Jan. 7, 1933	Week ended Jan. 6, 1934	Week ended Jan. 7, 1933	Week ended Jan. 6, 1934	Week ended Jan. 7, 1933	Week ended Jan. 6, 1934	Week ended Jan. 7, 1933
West South Central States:								
Arkansas	16	7	10	11, 138	150	4	1	0
Louisiana	26	16	9	653	11	8	0	3
Oklahoma [5]	75	18	93	1, 960	73	-------	3	1
Texas [3]	147	285	288	4, 452	270	20	2	1
Mountain States:								
Montana	1	2	17	5, 493	-------	175	0	0
Idaho	1	5	-------	5	20	12	0	0
Wyoming	-------	-------	-------	15	45	14	0	0
Colorado	13	4	-------	138	8	6	0	0
New Mexico	5	3	-------	7	59	2	0	0
Arizona	4	3	21	26	8	-------	3	0
Utah [2]	-------	1	-------	12	558	1	1	0
Pacific States:								
Washington	1	4	-------	11	284	1	0	1
Oregon	1	1	51	1, 274	46	24	0	1
California	28	51	39	1, 039	390	98	0	7
Total	1, 043	1, 155	2, 051	72, 241	8, 578	4, 004	42	98

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Jan. 6, 1934	Week ended Jan. 7, 1933	Week ended Jan. 6, 1934	Week ended Jan. 7, 1933	Week ended Jan. 6, 1934	Week ended Jan. 7, 1933	Week ended Jan. 6, 1934	Week ended Jan. 7, 1933
New England States:								
Maine	0	2	8	29	0	0	1	0
New Hampshire	0	0	7	21	0	0	1	0
Vermont	1	0	20	28	0	0	0	1
Massachusetts	0	1	168	347	0	0	1	2
Rhode Island	0	0	10	37	0	0	1	0
Connecticut	0	0	63	91	0	0	0	0
Middle Atlantic States:								
New York	2	1	528	637	0	0	6	10
New Jersey	2	1	144	245	0	0	5	1
Pennsylvania	0	2	569	692	0	0	11	20
East North Central States:								
Ohio	1	1	372	500	2	9	1	7
Indiana	0	0	168	164	5	3	0	2
Illinois	1	2	401	414	0	3	4	0
Michigan	0	0	150	152	0	1	2	1
Wisconsin	1	1	60	62	24	1	0	4
West North Central States:								
Minnesota	1	1	40	76	3	3	2	0
Iowa [2]	0	0	79	25	7	39	0	0
Missouri	0	0	134	108	12	4	3	3
North Dakota	0	0	27	23	0	0	1	0
South Dakota	0	0	35	6	1	2	0	173
Nebraska	0	1	30	46	2	1	0	0
Kansas	0	1	110	71	7	2	1	0
South Atlantic States:								
Delaware	0	0	7	10	0	0	0	0
Maryland [3]	0	0	81	81	0	0	4	7
District of Columbia	0	0	13	14	0	0	0	0
Virginia	0	0	126	65	0	0	15	11
West Virginia	1	0	82	56	0	1	1	0
North Carolina [3] [4]	1	0	83	46	0	0	7	4
South Carolina [3]	1	2	15	9	0	2	8	2
Georgia [3]	0	1	9	5	0	0	5	5
Florida [3]	0	0	4	3	0	0	1	5
East South Central States:								
Kentucky	0	0	79	40	0	1	1	2
Tennessee	1	1	87	40	0	0	6	10
Alabama [3]	0	0	29	27	0	2	4	1
Mississippi [3]	0	0	25	19	1	0	8	2

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Jan. 6, 1934, and Jan. 7, 1933—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Jan. 6, 1934	Week ended Jan. 7, 1933	Week ended Jan. 6, 1934	Week ended Jan. 7, 1933	Week ended Jan. 6, 1934	Week ended Jan. 7, 1933	Week ended Jan. 6, 1934	Week ended Jan. 7, 1933
West South Central States:								
Arkansas	0	0	11	26	1	2	0	0
Louisiana	2	0	10	12	0	2	7	6
Oklahoma [5]	0	0	39	17	3	0	3	1
Texas [3]	0	0	148	70	26	5	20	9
Mountain States:								
Montana	0	0	7	13	4	5	4	1
Idaho	0	0	13	2	0	7	1	1
Wyoming	0	0	5	5	0	0	0	0
Colorado	0	0	26	60	2	0	1	2
New Mexico	1	0	24	19	0	0	4	1
Arizona	0	0	13	5	0	0	0	1
Utah [2]	0	0	10	22	0	0	0	0
Pacific States:								
Washington	0	1	40	20	2	13	0	1
Oregon	0	0	51	29	8	2	2	3
California	2	3	196	159	10	9	18	11
Total	18	22	4,358	4,717	120	119	160	310

[1] New York City only.
[2] Week ended earlier than Saturday.
[3] Typhus fever, week ended Jan. 6, 1934, 29 cases, as follows: North Carolina, 4; South Carolina, 2; Georgia, 3; Florida, 1; Alabama, 15; Texas, 4.
[4] Rocky Mountain spotted fever, week ended Jan. 6, 1934, North Carolina, 1 case.
[5] Exclusive of Oklahoma City and Tulsa.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week:

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
November 1933										
Mississippi	2	146	898	4,679	670	291	2	151	13	45
December 1933										
Arkansas		80	117	177	596	20	0	88	11	7
Connecticut	5	26	45		42		1	240	0	1
Delaware	1	4	6		17		2	34	0	3
Maine		14	32		5		2	34	0	4
Missouri	6	361	46	2	560		1	743	19	26
Nebraska	3	28			39		3	151	11	11
Wyoming					112		0	34	0	0

November 1933

	Cases
Mississippi:	
Chicken pox	333
Dengue	15
Dysentery (amoebic)	76
Hookworm disease	353
Mumps	81
Puerperal septicemia	24
Rabies in animals	2
Trachoma	1
Undulant fever	1
Whooping cough	336

December 1933

	Cases
Botulism:	
Connecticut	1
Chicken pox:	
Arkansas	111
Connecticut	554
Delaware	35
Maine	251
Missouri	413
Nebraska	325
Wyoming	87
Conjunctivitis (infectious):	
Connecticut	1

December 1933—Continued

	Cases
Dysentery:	
Connecticut (amoebic)	1
Missouri	29
Nebraska (amoebic)	11
German measles:	
Connecticut	6
Maine	96
Wyoming	63
Hookworm disease:	
Arkansas	8
Lead poisoning:	
Connecticut	3

December 1933—Continued

	Cases
Lethargic encephalitis:	
Connecticut	1
Missouri	22
Nebraska	1
Mumps:	
Arkansas	9
Connecticut	255
Delaware	1
Maine	9
Missouri	116
Nebraska	22
Wyoming	7
Ophthalmia neonatorum:	
Connecticut	1
Rabies in animals:	
Connecticut	7
Missouri	28

December 1933—Continued

	Cases
Septic sore throat:	
Connecticut	7
Missouri	33
Nebraska	1
Wyoming	4
Tetanus:	
Maine	1
Trachoma:	
Arkansas	2
Trichinosis:	
Connecticut	1
Tularaemia:	
Missouri	32
Undulant fever:	
Arkansas	1
Connecticut	1

December 1933—Continued

	Cases
Undulant fever—Contd.	
Delaware	1
Maine	4
Missouri	1
Nebraska	1
Vincent's infection:	
Maine	6
Whooping cough:	
Arkansas	67
Connecticut	167
Delaware	33
Maine	269
Missouri	207
Nebraska	183
Wyoming	8

WEEKLY REPORTS FROM CITIES

City reports for week ended Dec. 30, 1933

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths all causes
		Cases	Deaths								
Maine:											
Portland	0	------	0	0	6	0	0	0	1	5	20
New Hampshire:											
Concord	1	------	0	0	2	1	0	0	0	0	13
Manchester	0	------	1	1	1	2	0	0	0	0	21
Nashua	0	------	0	0	0	2	0	0	0	0	--------
Vermont:											
Barre	0	------	0	19	0	0	0	0	0	0	2
Burlington	0	------	0	0	0	1	0	0	0	0	15
Massachusetts:											
Boston	8	------	2	205	37	53	0	11	0	44	243
Fall River	1	------	0	0	2	3	0	2	0	0	24
Springfield	0	------	1	0	2	1	0	1	0	13	42
Worcester	3	------	0	192	7	2	0	0	0	9	46
Rhode Island:											
Pawtucket	0	------	0	0	0	0	0	0	0	0	24
Providence	4	------	1	0	6	8	0	2	0	7	66
Connecticut:											
Bridgeport	0	------	0	1	3	12	0	2	0	1	33
Hartford	0	------	0	0	2	6	0	2	0	0	52
New Haven	0	------	0	0	2	1	0	0	0	3	48
New York:											
Buffalo	1	------	1	154	18	22	0	8	0	27	163
New York	22	14	8	26	199	167	0	99	1	74	1,643
Rochester	2	------	0	2	5	14	0	0	0	9	69
Syracuse	1	------	0	0	4	8	0	0	0	25	48
New Jersey:											
Camden	0	------	0	18	3	12	0	2	0	0	33
Newark	0	3	0	1	12	9	0	7	0	19	107
Trenton	0	2	0	1	0	10	0	2	0	2	35
Pennsylvania:											
Philadelphia	0	13	5	178	44	62	0	22	1	30	552
Pittsburgh	10	7	2	4	38	29	0	4	0	34	199
Reading	1	------	0	2	5	9	0	0	0	8	36
Ohio:											
Cincinnati	------	------	------	------	------	------	------	------	------	------	------
Cleveland	12	41	3	1	25	29	0	16	0	31	233
Columbus	3	2	2	1	9	31	0	2	0	6	79
Toledo	2	1	1	29	6	26	0	5	0	8	80
Indiana:											
Fort Wayne	4	------	0	0	1	3	0	0	0	0	21
Indianapolis	2	------	0	6	10	11	0	4	2	7	--------
South Bend	0	------	0	0	1	6	0	0	0	0	15
Terre Haute	2	------	1	25	0	2	0	0	1	0	17
Illinois:											
Chicago	0	2	6	7	51	195	0	31	1	93	695
Cicero	0	------	0	0	0	0	0	0	0	0	10
Springfield	1	1	1	0	4	2	0	0	0	6	16
Michigan:											
Detroit	7	2	1	6	22	84	0	13	0	49	248
Flint	0	------	0	3	1	44	0	2	1	2	29
Grand Rapids	0	------	1	0	4	11	0	0	0	1	38

City reports for week ended Dec. 30, 1933—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths all causes
Wisconsin:											
Kenosha	0	------	0	0	1	9	0	0	0	3	11
Madison	0	------	1	1	2	4	0	0	0	8	33
Milwaukee	1	2	1	4	9	22	0	8	0	43	106
Racine	0	1	0	0	0	10	0	1	0	4	10
Superior	0	------	0	0	0	0	0	1	0	2	4
Minnesota:											
Duluth	0	------	0	1	5	0	0	0	0	0	24
Minneapolis	5	------	0	0	11	8	0	0	0	0	106
St. Paul	0	------	0	0	8	6	0	0	0	3	72
Iowa:											
Des Moines	3	------	------	0	------	9	0	------	0	0	34
Sioux City	1	------	------	1	------	1	0	------	0	0	------
Waterloo	0	------	------	6	------	2	0	------	0	15	------
Missouri:											
Kansas City	6	------	0	2	16	20	0	5	0	16	100
St. Joseph	1	------	0	1	1	3	0	0	0	0	11
St. Louis	20	2	1	117	16	15	0	7	4	18	225
North Dakota:											
Fargo	0	------	0	13	0	1	0	0	0	0	8
Grand Forks	0	------	0	0	0	0	0	0	0	0	------
South Dakota:											
Aberdeen	0	------	0	0	0	0	0	0	0	0	------
Sioux Falls	0	------	0	55	0	0	0	0	0	0	7
Nebraska:											
Omaha	3	------	0	4	7	7	2	2	1	5	54
Kansas:											
Topeka	0	------	0	0	4	6	0	2	0	6	39
Wichita	1	------	0	0	2	8	0	3	0	7	27
Delaware:											
Wilmington	3	------	0	12	7	4	0	0	0	3	50
Maryland:											
Baltimore	2	23	5	4	32	29	0	12	0	67	248
Cumberland	2	1	0	0	4	3	0	0	0	0	13
Frederick	0	------	0	0	0	1	0	0	0	0	6
District of Columbia:											
Washington	9	1	0	48	17	19	0	9	2	14	173
Virginia:											
Lynchburg	2	------	0	0	0	1	0	0	0	0	5
Norfolk	0	------	0	0	5	5	0	0	0	0	28
Richmond	4	------	1	0	6	13	0	4	1	0	45
Roanoke	1	------	0	0	1	3	0	0	0	2	16
West Virginia:											
Charleston	0	1	0	0	4	4	0	0	0	0	14
Huntington	2	------	0	0	0	17	0	0	0	0	------
Wheeling	0	------	0	1	5	3	0	0	0	0	16
North Carolina:											
Raleigh	0	------	0	0	0	0	0	0	0	1	2
Wilmington	0	------	0	0	2	0	0	1	0	1	17
Winston-Salem	2	------	0	204	3	4	0	1	0	0	19
South Carolina:											
Charleston	0	28	0	0	1	2	0	0	1	7	26
Columbia	------	------	------	------	------	------	------	------	------	------	------
Greenville	0	------	0	0	2	1	0	0	0	0	12
Georgia:											
Atlanta	1	36	0	15	2	2	0	2	0	1	74
Brunswick	0	------	0	5	0	0	0	0	1	0	5
Savannah	0	3	3	10	2	4	0	4	0	0	35
Florida:											
Miami	1	------	1	0	1	0	0	1	0	6	32
Tampa	7	1	0	0	3	0	0	1	0	0	29
Kentucky:											
Ashland	1	------	------	0	------	1	0	------	0	0	------
Lexington	5	------	0	0	2	4	0	2	1	5	17
Louisville	5	2	0	0	6	10	0	0	0	13	54
Tennessee:											
Memphis	3	------	1	8	5	5	0	3	0	2	85
Nashville	5	------	0	36	6	11	0	3	0	1	------
Alabama:											
Birmingham	1	3	0	1	4	2	0	3	1	0	53
Mobile	3	------	1	1	1	0	0	1	0	0	35
Montgomery	1	------	------	4	------	1	0	------	0	0	------

City reports for week ended Dec. 30, 1933—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths all causes
		Cases	Deaths								
Arkansas:											
Fort Smith	0	------	------	1	------	2	0	------	0	4	------
Little Rock	0	------	1	6	1	1	0	3	0	0	5
Louisiana:											
New Orleans	22	------	2	0	12	15	0	12	0	0	141
Shreveport	3	------	0	0	5	2	0	4	0	0	31
Oklahoma:											
Tulsa	0	------	------	1	------	1	0	------	0	2	------
Texas:											
Dallas	14	1	1	0	2	5	0	6	0	0	58
Fort Worth	5	------	1	0	6	10	0	1	0	0	52
Galveston	0	------	0	0	2	4	0	0	0	0	11
Houston	8	------	0	0	12	2	0	2	0	0	71
San Antonio	2	------	4	0	12	4	0	3	0	0	83
Montana:											
Billings	0	------	0	0	0	0	0	0	0	0	1
Great Falls	0	------	0	0	0	0	0	0	0	0	9
Helena	0	------	0	0	0	0	0	0	0	0	5
Missoula	0	1	0	0	0	0	0	0	0	0	9
Idaho:											
Boise	0	------	0	0	1	0	0	0	0	1	21
Colorado:											
Denver	0	33	0	0	7	12	0	7	0	44	73
Pueblo	0	------	0	1	1	1	0	1	0	3	8
New Mexico:											
Albuquerque	0	------	0	0	0	2	0	5	0	3	13
Utah:											
Salt Lake City	0	------	1	372	3	7	1	0	0	13	34
Nevada:											
Reno	0	------	0	0	0	0	0	0	0	0	4
Washington:											
Seattle	0	------	2	1	11	5	0	3	0	49	104
Spokane	0	1	1	229	------	3	0	1	0	5	31
Tacoma	0	------	0	0	2	3	0	0	0	5	30
Oregon:											
Portland	5	------	0	4	5	24	2	2	1	1	70
Salem	0	2	0	0	0	0	0	0	0	0	------
California:											
Los Angeles	13	30	1	5	21	47	0	16	6	45	267
Sacramento	1	------	0	4	8	5	0	2	3	0	41
San Francisco	1	2	0	3	7	19	0	7	0	5	165

State and city	Meningococcus meningitis		Poliomyelitis cases	State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Rhode Island:				Iowa:			
Providence	0	0	1	Waterloo	1	1	0
New York:				Nebraska:			
New York	0	0	1	Omaha	0	0	1
Pennsylvania:				Maryland:			
Philadelphia	1	0	0	Baltimore	1	0	0
Reading	0	1	0	North Carolina:			
Indiana:				Winston-Salem	0	0	1
South Bend	0	1	0	Georgia:			
Illinois:				Atlanta	1	0	0
Chicago	4	1	0	California:			
Michigan:				Los Angeles	1	2	1
Detroit	1	0	0	San Francisco	1	0	0
Minnesota:							
St. Paul	0	0	1				

Pellagra.—Cases: Charleston, S.C., 2; Savannah, 1.
Typhus fever.—Cases: Baltimore, 1; Charleston, S.C., 1.
Lethargic encephalitis, St. Louis, 1 case.

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—2 weeks ended December 16, 1933.—During the 2 weeks ended December 16, 1933, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada, as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta [1]	British Columbia	Total
Cerebrospinal meningitis					1					1
Chicken pox		17		397	491	276	90		103	1,374
Diphtheria		5	4	61	22	20	2			114
Erysipelas				5	8	2	2		3	20
Influenza		4		19	5	2			33	63
Lethargic encephalitis						1	2			3
Measles				56	18	1	97		5	177
Mumps					161	7	1		59	228
Paratyphoid fever					1					1
Pneumonia		5			46		2		3	56
Poliomyelitis				3	3	1				7
Scarlet fever		14	28	302	341	61	6		117	869
Tuberculosis	7		10	80	89	14	10		31	241
Typhoid fever			1	26	13		4		3	47
Undulant fever				1	2				1	4
Whooping cough		38	2	273	128	56	45		22	564

[1] No report has been received from Alberta for the 2 weeks ended Dec. 16, 1933.

Quebec Province—Communicable diseases—2 weeks ended December 30, 1933.—The Bureau of Health of the Province of Quebec, Canada, reports cases of certain communicable diseases for the 2 weeks ended December 30, 1933, as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	1	Ophthalmia neonatorum	2
Chicken pox	278	Poliomyelitis	1
Diphtheria	35	Puerperal septicemia	2
Erysipelas	11	Scarlet fever	125
German measles	3	Tuberculosis	80
Influenza	12	Typhoid fever	22
Measles	26	Whooping cough	226

CUBA

Habana—Communicable diseases—4 weeks ended December 31, 1933.—During the 4 weeks ended December 31, 1933, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Chicken pox	1		Measles	2	
Diphtheria	17	1	Scarlet fever	1	
Leprosy	1		Tuberculosis	13	2
Malaria	57	4	Typhoid fever	6	3

CZECHOSLOVAKIA

Communicable diseases—October 1933.—During the month of October 1933, certain communicable diseases were reported in Czechoslovakia, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	2		Paratyphoid fever	32	2
Cerebrospinal meningitis	14	6	Poliomyelitis	14	
Chicken pox	413		Puerperal fever	45	23
Diphtheria	3,084	171	Scarlet fever	3,422	22
Dysentery	14	1	Trachoma	180	
Influenza	41	4	Typhoid fever	621	52
Lethargic encephalitis	2	2	Typhus fever		1
Malaria	194				

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

(NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for Dec. 29, 1933, pp. 1571-1583. A similar cumulative table will appear in the PUBLIC HEALTH REPORTS to be issued Jan. 26, 1934, and thereafter, at least for the time being, in the issue published on the last Friday of each month.)

Cholera

Philippine Islands.—During the week ended January 6, 1934, cholera was reported in the Philippine Islands as follows: Bohol Province—Antequera, 2 cases, 2 deaths; Calape, 17 cases, 11 deaths; Clarin, 2 cases, 1 death; Cortes, 1 death; Loon, 12 cases, 8 deaths; Lope, 5 cases, 4 deaths; Maribohog, 3 cases, 3 deaths; Tubigon, 37 cases, 29 deaths. Cebu Province—Argao, 2 cases, 2 deaths; Carcar, 5 cases, 3 deaths; Sibonga, 5 cases, 3 deaths. Occidental Negros Province—Calatraba, 4 cases, 2 deaths; San Carlos, 4 cases, 3 deaths. Oriental Negros Province—Bais, 6 cases, 5 deaths; Poblacion, 2 cases, 2 deaths; Santa Teresa, 1 case, 1 death; Tanjay, 14 cases, 6 deaths.

Plague

Hawaii Territory—Paauilo.—On December 21, 1933, 1 plague-infected rat was reported in Paauilo, Hamakua district, Island of Hawaii.

Yellow Fever

French West Africa—Guinea.—On December 31, 1933, 2 cases of yellow fever with 2 deaths were reported in Konakri, Guinea, French West Africa.

Ivory Coast—Abengourou.—On December 20, 1933, 1 case of yellow fever with 1 death and 1 suspected case of yellow fever were reported in Abengourou, Ivory Coast.

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